Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (please print)

Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Section (underline one): Trombetta Shattuck

ECE 2300 – Final Exam

May 5, 2012

Keep this exam closed and face up until you are told to begin.

1. This exam is closed book, closed notes. You may use one 8.5” x 11” crib sheet, or its equivalent.

2. Show all work on these pages. Show all work necessary to complete the problem. A solution without the appropriate work shown will receive no credit. A solution which is not given in a reasonable order will lose credit.

3. It is assumed that your work will begin on the same page as the problem statement. If you choose to begin your work on another page, you must indicate this on the page with the problem statement, with a clear indication of where the work can be found. **If your work continues on to another page, indicate clearly where your work can be found. Failure to indicate this clearly will result in a loss of credit.**

4. Show all units in solutions, intermediate results, and figures. Units in the exam will be included between square brackets.

5. Do not use red ink. Do not use red pencil.

6. You will have 170 minutes to work on this quiz.

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_/20 2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_/30

3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_/35 4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_/40

5. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_/40 6. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_/35

Total\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_/200

Room for extra work

1. (20 points) Find the equivalent resistance at terminals A, B for the circuit below.



2. (30 points) Use the node voltage method to write a complete set of equations that could be used to solve the circuit below. Do not simplify the circuit. Do not attempt to solve the equations. You must define all circuit variables, or you will not get any credit for the problem.



Room for extra work

3. (35 points) In the circuit below, the voltmeter V is a multi-range voltmeter with 10 [V] and 20 [V] full-scale readings, as shown to the right. It is connected into the circuit using the 20 [V] full-scale terminals. The switch in the circuit on the left was open for a long time, and then closed at t = 0. What is the reading on the voltmeter 0.01[ms] after the switch closes?



Room for extra work

4. (40 points) In the circuit shown, both switches were closed for a long time. At t = 0, both switches opened simultaneously. At t = 1.5[ms], switch SW1 closed again. Find numerical expressions for *vx*(t) for t > 0.



Room for extra work

5. (40 points) A device was connected to a load L1 with impedance Z1 = 34 -83o []. As a result, the voltage at the terminals of the load was *vX(t)* = 20.21 [V] cos(750[rad/s] t + 164.3o) in steady-state. Load L1 was removed, and the device was connected to load L2 with an impedance Z2 = 120 + j95 [], resulting in *vW(t)* = 42.48 [V] cos(750[rad/s] t + 44.19o) in steady state. Find the steady state voltage *vZ(t)* that would result if the device were removed from L2 and connected to a load L3, if L3 is a 53[] resistor in series with a 40[mH] inductor.



Room for extra work

6. (35 points) In the circuit below, the source *vs* delivers power to the load, which is a 15[] resistor in series with a 200[mH] inductor. The frequency of this system is 60[Hz].

a) Find the complex power delivered to the load. For this part of the problem, assume that the capacitor Ccorr is not present.

b) The capacitor Ccorr is now added at terminals A, B to correct the power factor of the load. Find a value for Ccorr such that the power factor is 0.92.





























